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How do CDC pension schemes smooth members' pensions?

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The **'Minimising Longevity and Investment Risk while Optimising Future Pension Plans'** research programme is being funded by the Actuarial Research Centre.

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The Royal Mail Collective Pension Plan: the CDC vanguard

Royal Mail staff vote to strike over pensions

🕒 3 October 2017



Royal Mail, which has 142,000 employees in Britain, reached an agreement over pensions, pay, a shorter working week, culture and operational changes, it said in a statement.

Royal Mail said it and the CWU would lobby government to make necessary legislative and regulatory changes so a CDC scheme could be set up.



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CDC pensions could be 70% higher than DC and 40% more than DB, says WTW



Lecture - 'Can CDC turn base metal into pensions gold?' by John Ralfe

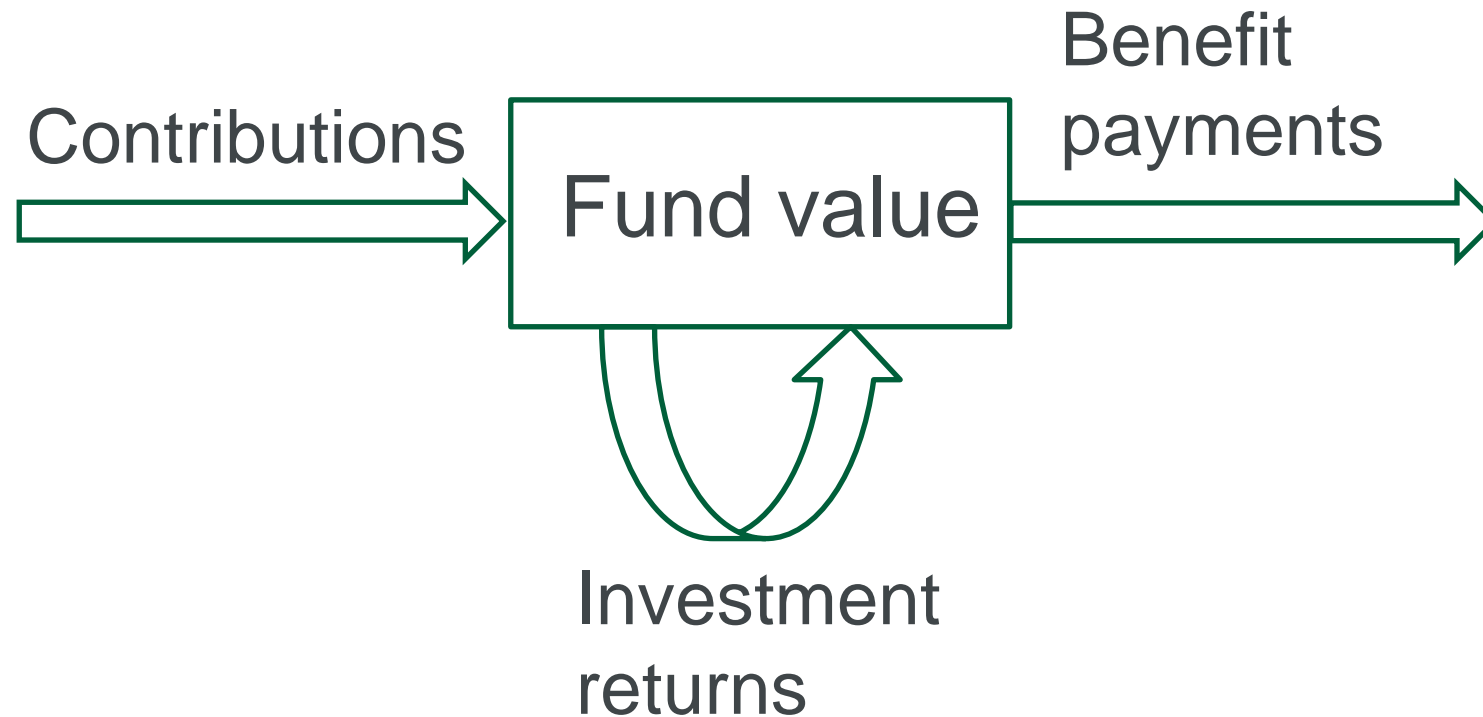


a Ponzi scheme.

CDC is a game of pass the risk parcel



CDC plan schematic



Comparison vs typical UK pension plans

Scheme type	Contribution levels	Benefit levels	Who bears the risk?	Who decides the level of risk?
Defined contribution (DC)	Fixed	Vary	Members	Whoever chooses the default fund
Collective Defined Contribution (CDC)	Fixed	Vary	Members	Trustees (and members?)
Defined Benefit (DB)	Vary	Fixed	Employers	Employers and trustees

Model a DB-like CDC scheme

- CDC scheme structure:
 - Whole-life scheme: members contribute for 40 years, retire at age 65 years.
 - Constant rate of benefit accrual, e.g. $1/80$ ths of salary per year.`
 - Constant contribution rate.
 - Benefit is a single-life pension paid from age 65.
- What inter-generational cross-subsidies exist in such a CDC scheme?

This is not the only type of CDC scheme!

- Another CDC scheme structure (not modelled here)
 - Decumulation (post-retirement only) scheme with only longevity risk-sharing – called a pooled annuity fund (another stream of research in the research programme...)
- Or a CDC scheme structure (not modelled here)
 - Like the whole-life scheme but with an age-related benefit accrual (accrue more benefit the younger you are, for the same contribution).
- Or ...
- Focus is on a Royal Mail-like CDC plan because it is the first CDC plan, very large and therefore very influential.



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Inter-generational cross-subsidies in this DB-like CDC scheme

#	When?	Who benefits?	How?
1	At each point in time (Age ladder risk transfer)	Older members (arguably; depends on risk appetite)	Annual pension increases
2	First generations subsidised by later generations	First generations	Constant benefit accrual (as not financially fair)
3	Across time	Depends (but cumulative \pm subsidy is calculable at each point in time)	Collective change to benefits due to e.g. predicted returns different to actual returns



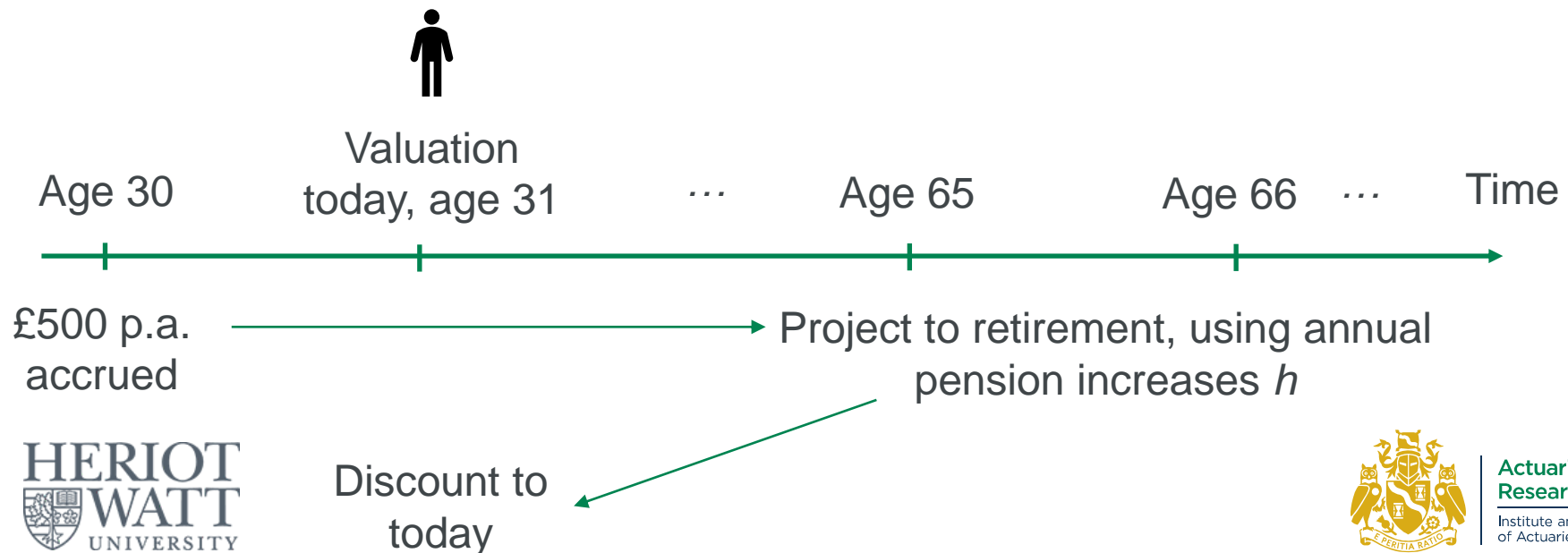
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How is collective risk-sharing done in the modelled CDC plan?

- Annual pension increases, which are determined collectively.
- Each member gets the same annual pension increase.

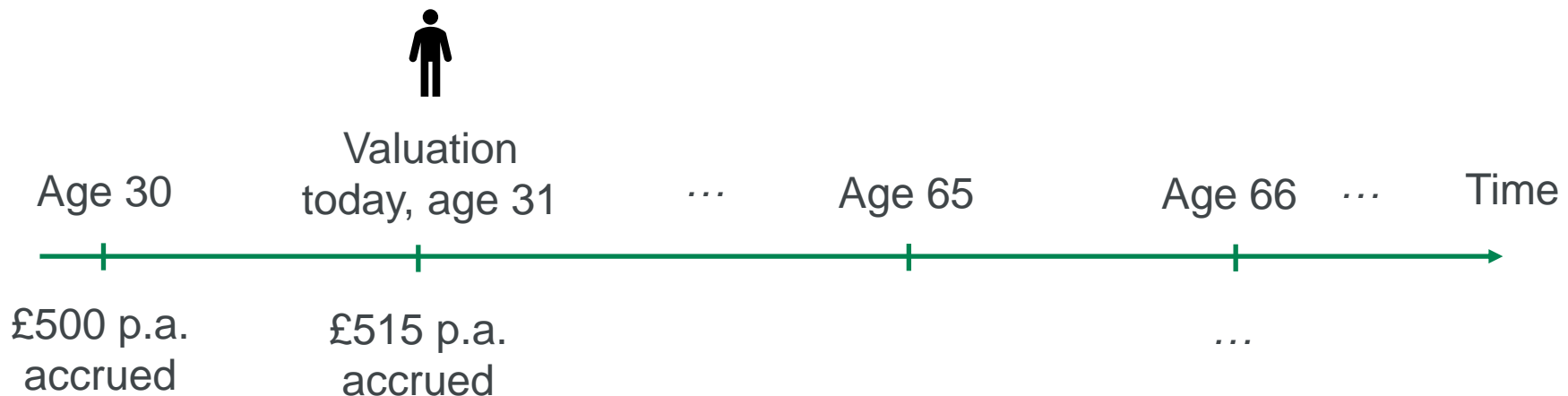
Collective pension increases

- Determine the annual pension increase h such that
 - Total asset value = Total discounted value of benefits, where
 - Total discounted value of benefits = Sum over all members, e.g.



Collective pension increases

- Today's revalued accrued pension
= $(1+h^*) \times$ Last year's accrued pension.
- E.g. $h^* = 3\%$



Inter-generational cross-subsidies in this DB-like CDC scheme

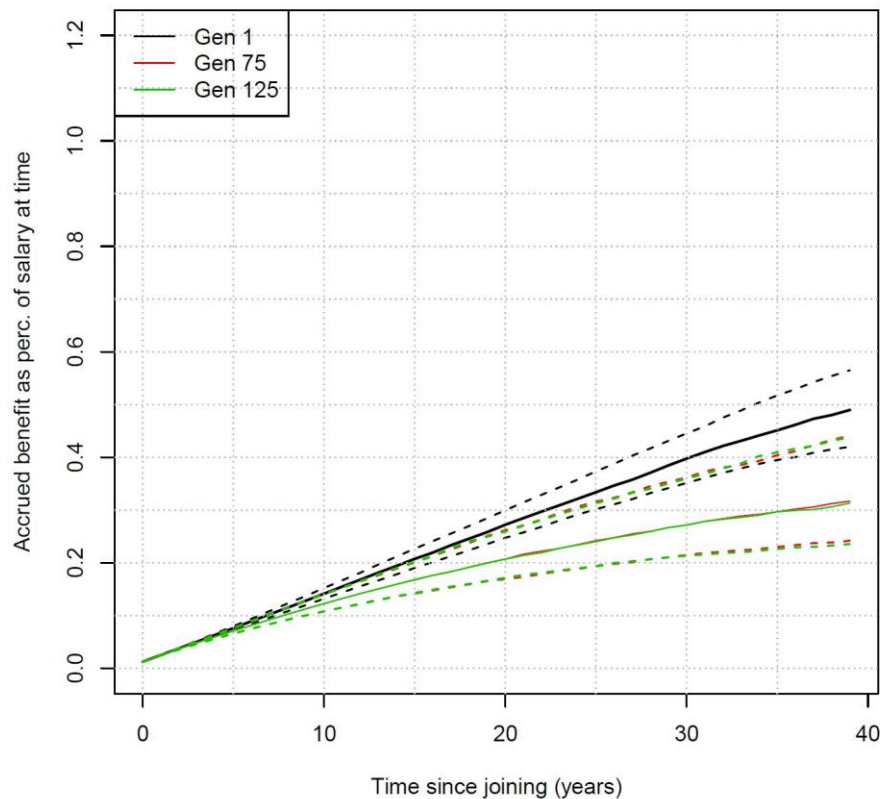
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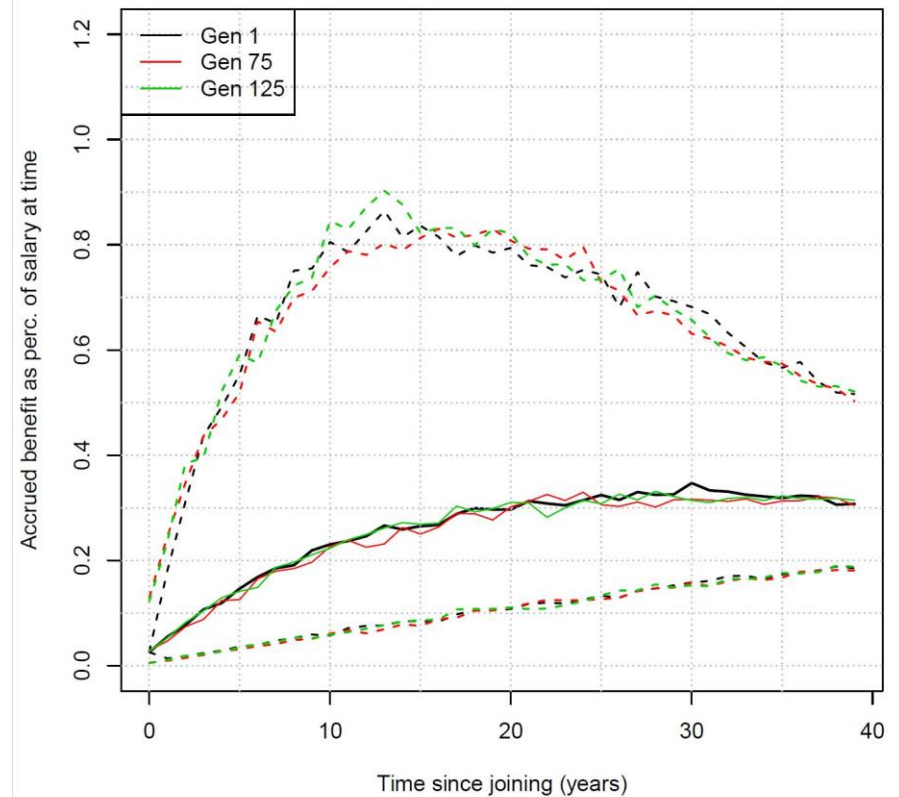
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Pension smoothing – up to retirement

CDC plan



DC plan



Inter-generational risk transfer at each point in time

- Pension smoothing occurs because of the annual pension increases
- Example:
 - Suppose h^* is 3%.
 - Suddenly, the asset value falls by 10%. Everything else unchanged.
 - The new h^* is re-calculated to be 2.4%.



Age ladder risk transfer

- The **amount** of each member's accrued pension goes up by less: 2.4%, instead of 3%.
- How does the **value** of each member's accrued pension change?

# years to retirement	1	2	...	20	...	38	39
If asset value ↓10%	-5.1%	-5.7%	...	-15.5%	...	-23.9%	-24.4%
Value change in DC plan	-10%	-10%	...	-10%	...	-10%	-10%



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Age ladder risk transfer

- If asset value increases by 10% instead, **amount** of each member's accrued pension goes up by more: 3.5%, instead of 3%.
- **Value** of each member's accrued pension changes as follows:

# years to retirement	1	2	...	20	...	38	39
If asset value ↑10%	+4.8%	+5.4%	...	+16.1%	...	+27.3%	+28.0%
Value change in DC plan	+10%	+10%	...	+10%	...	+10%	+10%



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Age ladder risk transfer→Pension smoothing

- Due to annual pension increases,
 - Everyone gets the same annual increase on the amount of their accrued pension, but
 - The value of the accrued pension changes differently;
 - Younger members' accrued pension value is more volatile than older members', for the same investment returns.
- CDC scheme can take more investment risk for longer, and still protect older members from volatility in their pension amount
- Younger members exposed if returns are generally poor over sustained periods; can't recover their losses.
- CETVs for younger members.



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Constant benefit accrual means later generations subsidise the first generations

- Consider a scheme which has:
 - Constant contributions and
 - Age-related benefit accrual such that:

Value of each contribution = Value of benefit accrued by that contribution.

i.e. financially fair on an accrued basis.

- Target pension is £100 per annum at retirement.

Age-related benefit accrual + Constant contributions

Age	35	40	45	50	55	64
Compound accrual percentage	4.7%	4.1%	3.6%	3.2%	2.8%	2.3%
Cumulative accrual percentage	4.7%	26.3%	45.5%	62.4%	77.3%	100%
Contribution amount per £100 p.a. target benefit	£36	£36	£36	£36	£36	£36

Constant benefit accrual means later generations subsidise the first generations

- Consider another scheme which has:

- Constant rate of benefit accrual and
- Age-related contributions such that:

Value of each contribution = Value of benefit accrued by that contribution.

i.e. financially fair on an accrued basis.

- Target pension is £100 per annum at retirement.

Constant benefit accrual rate + Age-related contributions

Age	35	40	45	50	55	64
Compound accrual percentage	4.7%	4.1%	3.6%	3.2%	2.8%	2.3%
Cumulative accrual percentage	4.7%	26.3%	45.5%	62.4%	77.3%	100%
Contribution amount per £100 p.a. target benefit	£36	£36	£36	£36	£36	£36
Age	35	40	45	50	55	64
Constant accrual percentage	3.3%	3.3%	3.3%	3.3%	3.3%	3.3%
Cumulative accrual percentage	3.3%	20.0%	36.7%	53.3%	70.0%	100%
Contribution amount per £100 p.a. target benefit	£25	£29	£33	£37	£42	£52

Constant benefit accrual rate + Constant contributions

Age	35	40	45	50	55	64
Compound accrual percentage	4.7%	4.1%	3.6%	3.2%	2.8%	2.3%
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Contribution amount per €100 p.a. target benefit	£25	£29	£33	£37	£42	£52

Subsidy of first generations by later ones

- Consider a CDC scheme which has:
 - Constant rate of benefit accrual and
 - Constant contributions such that:

Value of future lifetime contributions = Value of total benefit accrued over lifetime

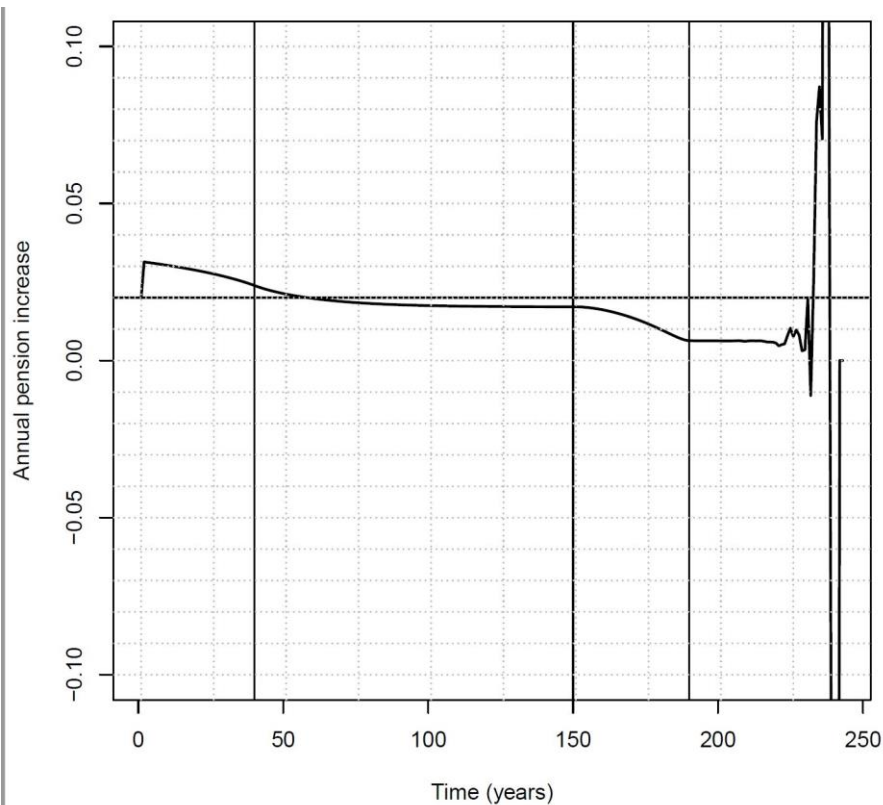
BUT

Value of each contribution \neq Value of benefit accrued by that contribution.

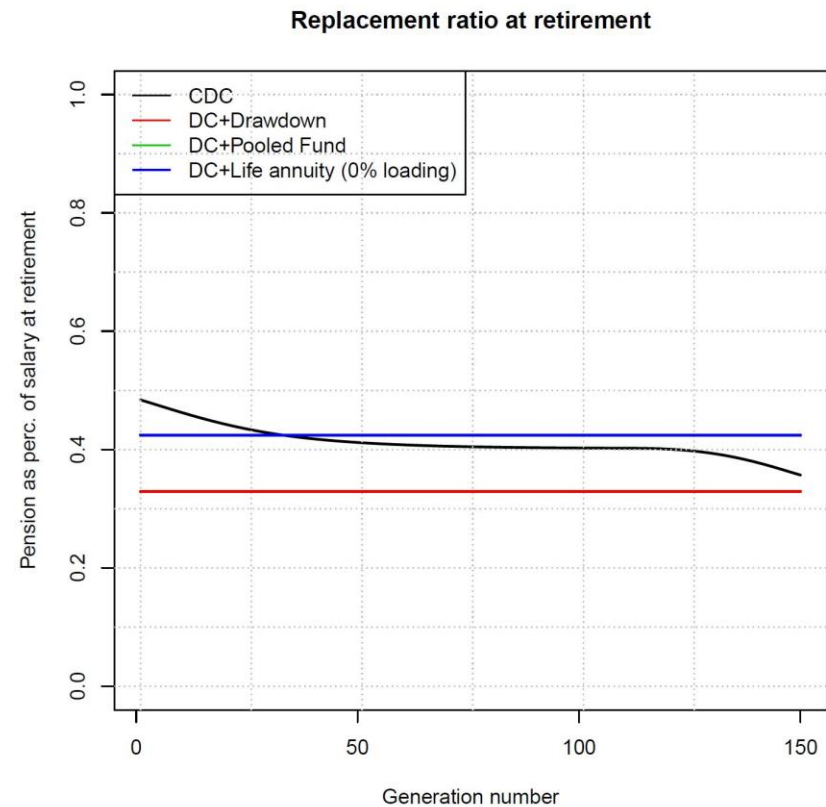
i.e. financially fair on a lifetime basis but NOT on an accrued basis.

Economic basis turns out as expected (e.g. inflation=2% p.a.)

Annual pension increases

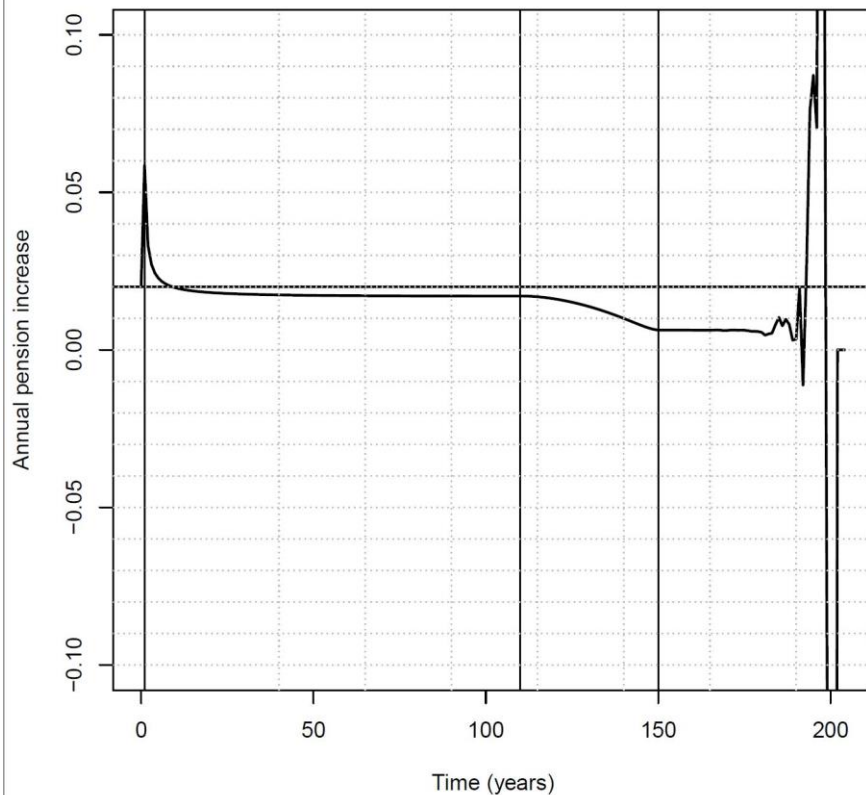


Replacement ratio at retirement

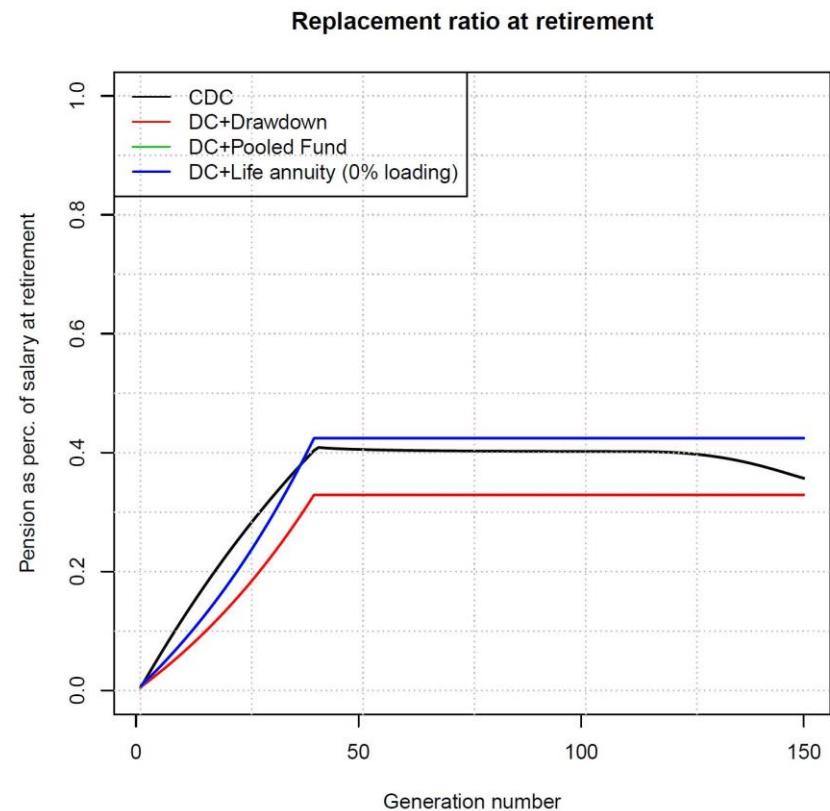


At time 0, first generation joins at age 64,
second generation at age 63, third at age
62,.....

Annual pension increases

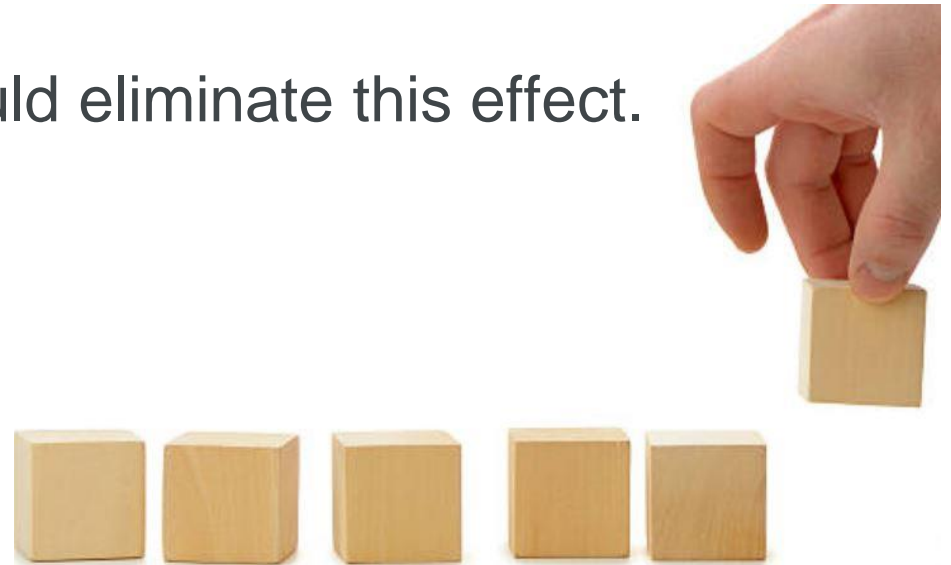


Replacement ratio at retirement



How much benefit should be accrued by each contribution?

- Larger-than-expected pension increases for the first generations in the scheme...
- ...Due to constant rate of benefit accrual (e.g. $1/80$ ths of salary).
- For later generations to join, effect is diminished by magnitude of scheme asset value.
- Age-related benefit accrual would eliminate this effect.



Inter-generational cross-subsidies in this DB-like CDC scheme

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“Across time” cross-subsidy

- Payment of pensions requires predictions about the future.
- Predictions too rosy means too much paid out now, and later generations get less.
- Predictions too pessimistic means too little paid out now, and later generations get more.



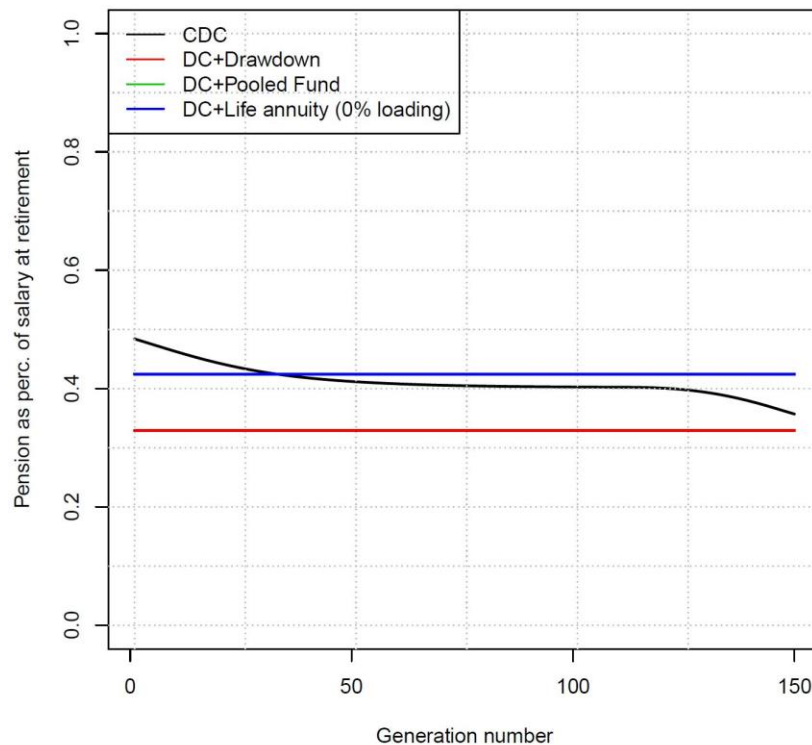
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Expect investment return of 5% per annum

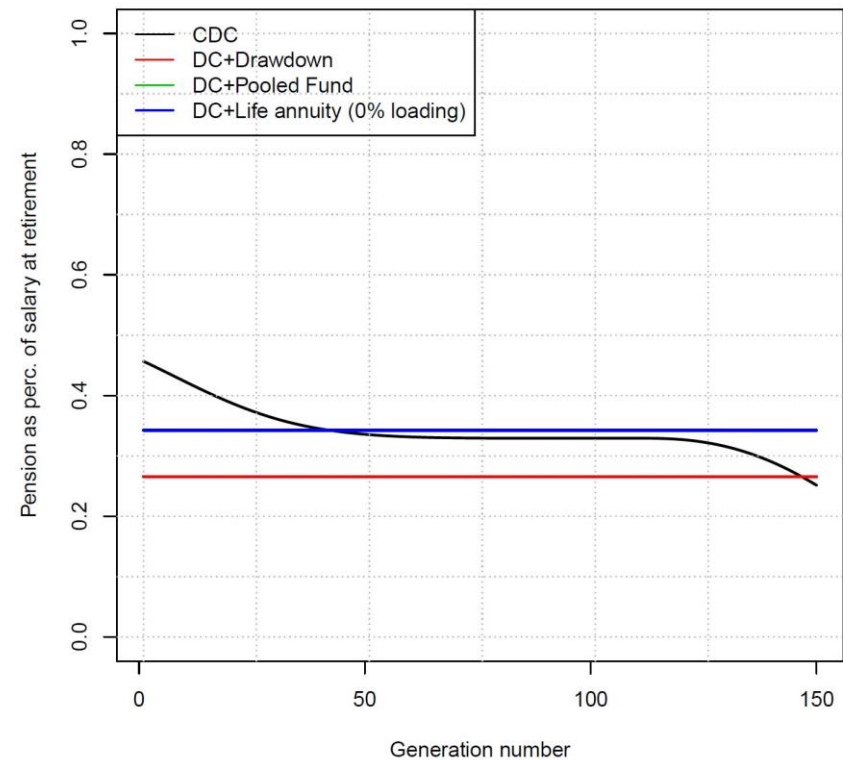
Actual return is 5% p.a.

Replacement ratio at retirement



Actual return is 4% p.a.

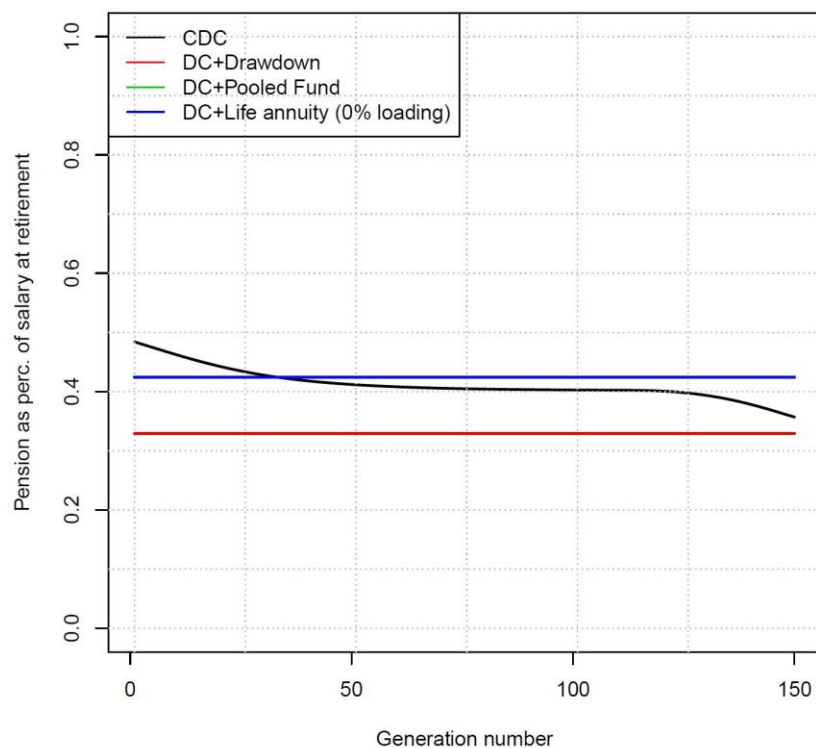
Replacement ratio at retirement



Expect investment return of 5% per annum

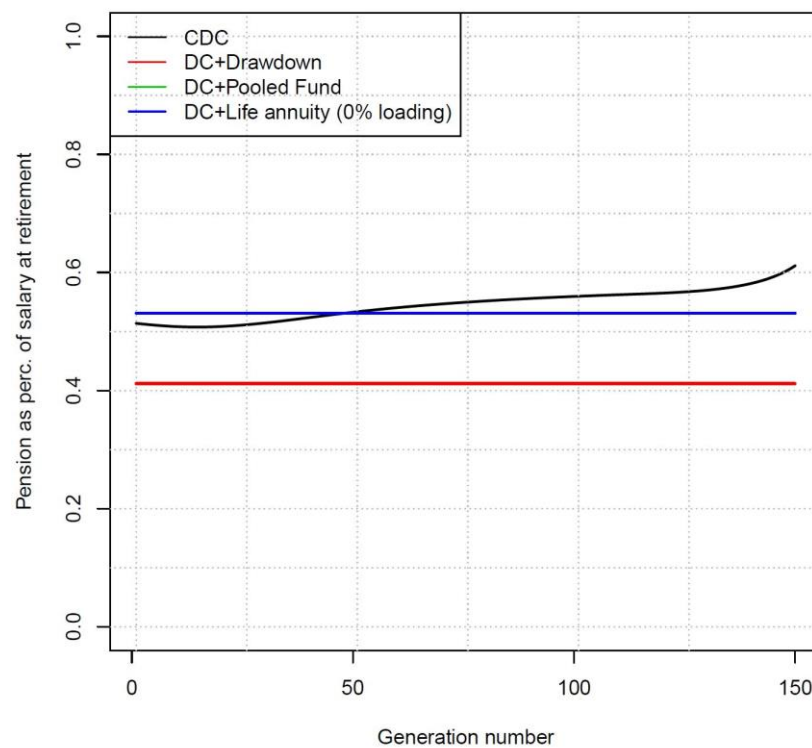
Actual return is 5% p.a.

Replacement ratio at retirement



Actual return is 6% p.a.

Replacement ratio at retirement



Summary

- Pension smoothing arises from transferring risk from older to younger members.
- This risk transfer reduces income volatility for older members.
- Possible justification for higher risk strategy (although risk is not eliminated; standard deviation of income increases with each generation).
- Constant rate of benefit accrual gives a pension increase 'anomaly' which can be removed through age-related benefit accrual, if desired.
- Cumulative subsidy due to predictions different to expectations remains, as in similar schemes.



Other research results on this theme

- Comparison of CDC plan to alternative DC savings followed by:
 - Life annuity purchase,
 - Pooled annuity fund (Post-retirement CDC plan), or
 - Income Drawdown.
- ...Another webinar!



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Bibliography

- Barajas-Paz and Donnelly (2022). “An attribution analysis of investment risk-sharing in collective defined contribution schemes”. *Submitted*.
- Donnelly (2022). “Inter-generational cross-subsidies in the UK's first CDC pension scheme”. *Submitted*.

Questions

Comments



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The Actuarial Research Centre (ARC) is the Institute and Faculty of Actuaries' (IFoA) network of actuarial researchers around the world.

The ARC seeks to deliver cutting-edge research programmes that address some of the significant, global challenges in actuarial science, through a partnership of the actuarial profession, the academic community and practitioners.

The '**Minimising Longevity and Investment Risk while Optimising Future Pension Plans**' research programme is being funded by the ARC.

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